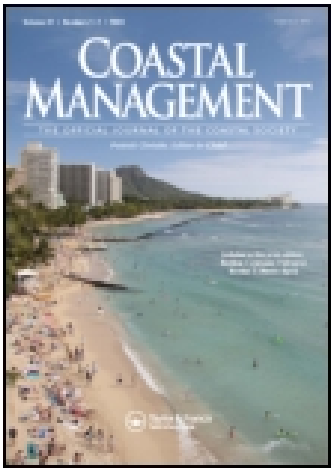

Coastal Management
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/ucmg20

Social Sciences in Puget Sound Recovery

Katharine F. Wellman[a], Kelly Biedenweg[bc] & Kathleen Wolf[d]

[a] Northern Economics, Inc. and Puget Sound Partnership Science Panel, Seattle, Washington, USA

[b] Puget Sound Institute, University of Washington, Tacoma, Washington, USA

[c] The U.S. Forest Service Pacific Northwest Research Station, Seattle, Washington, USA

[d] College of the Environment (or School of Environmental and Forest Sciences), University of Washington, Seattle, Washington, USA

Published online: 27 Jun 2014.

To cite this article: Katharine F. Wellman, Kelly Biedenweg & Kathleen Wolf (2014) Social Sciences in Puget Sound Recovery, Coastal Management, 42:4, 298-307, DOI: 10.1080/08920753.2014.923129

To link to this article: http://dx.doi.org/10.1080/08920753.2014.923129

Coastal Management, 42:298–307, 2014

ISSN: 0892-0753 print / 1521-0421 online
DOI: 10.1080/08920753.2014.923129

Taylor & Francis
Taylor & Francis Group

Introduction

Social Sciences in Puget Sound Recovery

KATHARINE F. WELLMAN,[1] KELLY BIEDENWEG,[2,3] AND KATHLEEN WOLF[4]

[1]Northern Economics, Inc. and Puget Sound Partnership Science Panel, Seattle, Washington, USA
[2]Puget Sound Institute, University of Washington, Tacoma, Washington, USA
[3]The U.S. Forest Service Pacific Northwest Research Station, Seattle, Washington, USA
[4]College of the Environment (or School of Environmental and Forest Sciences), University of Washington, Seattle, Washington, USA

The Role of Social Sciences in Ecosystem Recovery

Advancing the recovery of large-scale ecosystems, such as the Puget Sound in Washington State, requires improved knowledge of the interdependencies between nature and humans in that basin region. As Biedenweg et al. (this issue) illustrate, human wellbeing and human behavior do not occur independently of the biophysical environment. Natural environments contribute to human wellbeing through ecosystem services and humans influence natural environments through their behaviors. Historically, however, conservation and the recovery of degraded natural systems has been the purview of natural scientists (Fox et al. 2006). In the past decade, there has been growing acknowledgment among biologists, policymakers, and funders that the gap between biophysical and social sciences must be bridged (Nylus et al. 2002; Cheng, Kruger, and Daniels 2003; Lowe, Whitman, and Phillipson 2009). The success of recovery actions taken to date are increasingly understood to be limited in their effectiveness, in part, because social scientists have not systematically been included in problem identification (e.g., what threatens the health of ecosystems) and development of accompanying solution sets (priority ecosystem recovery strategies and actions) (Mascia 2003). It is thus clear that the recovery of large-scale ecosystems requires the integration of social and biophysical scientists to better understand drivers of change and tradeoffs among strategic opportunities.

What do the social sciences have to offer toward the goal of ecosystem recovery? Social scientists study the full diversity of social patterns at multiple scales, from individuals and local institutions to large social groups and transnational entities. Through systematic and iterative analyses and interpretations of empirical evidence, social scientists, like their natural science colleagues, build and test theories that can address the dynamic relationships between people and their environments, and the causes and consequences of

Address correspondence to Katharine F. Wellman, Northern Economics Inc., 1455 NW Leary Way, Suite 400, Seattle, WA 98107, USA. E-mail: Katharine.Wellman@norecon.com

social and environmental change. These research practices ultimately enable more accurate predictions of human responses to environmental policies, for example, and ideally result in improved ecosystem recovery across geographic scales. (Specifically, the contributions of environmental social scientists range from micro-analyses of how individual and group values and behaviors are related to environmental change, to macro-analyses of broad social, economic, and environmental trends.) Environmental social scientists can explain how and why people affect the environment, how the environment affects human wellbeing and quality of life, what kinds of policies do and do not work to change human behavior, and which social systems are best adapted to sustaining natural resources. Environmental demographers estimate changes in the size, composition, and distribution of human populations and model how these variables influence local ecosystems in the past, present, and future. Environmental economists quantify the economic values of ecosystem goods and services as decision-making tools for assessing social and ecological tradeoffs. Environmental anthropologists study how environments influence diverse cultures and how cultural values and social relationships affect resource use, social conflict, and receptivity to environmental policies. Other disciplines focusing on the human–environment relationship include: rural sociology, geography, political ecology, environmental psychology, environmental policy studies, environmental history, environmental philosophy, and environmental and natural resource law.

Like natural scientists, social scientists apply scientific methods and other rigorous standards of evidence to study these human aspects of the world. As is the case in all scientific investigations, the choice of research methods must be tailored to a research question or framework. Research designs may be inductive, deductive, comparative, historical, or experimental. Common measurement and data collection tools include lab experiments, sampling, censuses and surveys, archival analysis, remote sensing and interpretation, mapping, interviewing, and participant observation. Results vary from quantitative tables to narrative descriptions, and are reported using formats ranging from large-scale public databases to focused case studies. Analytic tools include, among others, statistics and mathematical modeling, econometrics, geographic information systems (GIS), psychometrics, and textual and discourse analysis.

In practice, however, ecosystem recovery is often assumed to be the domain of the natural sciences with little incorporation of the results from the social sciences in the development of adaptive and effective approaches to recovery. A large body of scholarship in the social sciences demonstrates that environmental policies based on natural science analyses alone often result in ineffective solutions, and at worst exacerbate social and environmental problems (Susskind, Jain, and Martyniuk 2001; Redman, Grove, and Kuby 2004). Environmental managers may consider involving social scientists during the policy implementation phase, with a primary focus on behavior change, after ecosystem condition assessments are underway. Yet, inclusion of social science during earlier problem-definition and policy development phases can arguably provide the necessary insights to shape broader perspectives on environmental conditions and human influences (Endter-Wada et al. 1998). It has also been assumed that the role of social scientists is to help resource agencies manage conflicts and avoid litigation, improve public participation processes, and provide environmental education to promote attitudinal and behavior changes (Endter-Wada et al. 1998). While such roles are important, successful ecosystem recovery also requires in-depth understanding of the economic, cultural, and political causes and consequences of environmental problems. In the Puget Sound, greater efforts are being made to engage social scientists across multiple disciplines to inform coastal zone management. This special issue

highlights five studies that demonstrate the diversity of relevant social science methods and topics and their utility to ecosystem recovery planning.

Puget Sound Context

Puget Sound is the second largest estuary in the United States, having more than 3,000 kilometers of shoreline (Shipman 2008). The glacial and tectonic processes that formed the Puget Sound basin resulted in a steep-sided fjord-like estuary with a relatively narrow fringe of shallow, nearshore habitat. Strong tidal exchanges drive much of the currents and vertical mixing in Puget Sound, but the net circulation of marine waters is largely a density-driven exchange between salt water from the Pacific Ocean that underlies and mixes with fresh water runoff from the surrounding watershed (Thomson 1994). Due to patterns of water movement and exchange, plankton tend to subsist a long time before being exported into major waterways, which contributes to the high local productivity of the sound.

The Puget Sound Basin is geologically, physiographically, and biologically diverse. The marine nearshore at the nexus of aquatic and terrestrial environments is crafted and maintained by processes involving transfers of sediment, nutrients, water, and other constituents. These attributes make the nearshore zone extremely important for maintaining ecosystem function and providing habitat for species, some for their entire life cycle and others for critical life stages. Many of these species are economically, socially, and culturally important (e.g., salmon, geoduck, Pacific oyster, Olympia oyster, Dungeness crab), while others have little market value but are ecologically important (e.g., sea grasses, kelp, forage fish). Upland watersheds are fundamental parts of the Puget Sound ecosystem through their many biological and hydrodynamic linkages. The dominant vegetation associations of the terrestrial landscape include some of the most productive coniferous forest communities in the world. The Center for Biological Diversity recognized 7,000 aquatic and terrestrial species that occur in the Puget Sound Basin, ranking the Puget Sound as a "hot spot" for biodiversity nationally.

The human population of Puget Sound reflects a significant ethnic and racial diversity, including a rich Native American heritage with numerous tribes living throughout the region. Puget Sound's natural capital provides a wide-ranging array of ecosystem goods and services (Stinchfield, Koontz, and Sexton 2009) that support a vibrant economic and social base, rich in tradition and culture. People from around the world are drawn to the area because of the relatively high quality of life (Puget Sound Partnership Strategic Science Plan 2010). Currently at about 4.3 million people, the population of the area is expected to increase to approximately 5.3 million people by 2025 (UERL 2008).

The region's diversified economy creates relative economic stability. Access to Puget Sound's resources supports the local economy directly, and in less tangible ways. Population growth supports increasing economic activity as people build homes, businesses, roads, and other infrastructure; consume fish, shellfish, and other animals; harvest timber and other resources; and recreate in marine waters, streams, and lakes. The Puget Sound region serves as the major North American gateway for trade with the Pacific Rim countries. The ports of Seattle and Tacoma together handle the second highest number of container ships in the nation (PSAT 2007). The area has one of the largest shellfish producing regions in the United States. The metro Seattle area is a world center for software development, information technology, and online commerce.

Settlement patterns and industrial development combined with the geophysical nature of the Puget Sound basin have led to increased deposition and retention of harmful contaminants, extensive shoreline modifications, reductions and alterations in biota populations, and disproportionate impact on ecosystem sustainability compared to shallow, flat estuaries. Specific anthropogenic stressors include highly consumptive land use alterations, inefficient use of resources, shoreline armoring to protect private property, introduction of invasive species, and pollution (Puget Sound Partnership 2010).

Just as human activities can negatively affect the health of ecosystems, degraded natural systems threaten the health and wellbeing of humans as well as marine wildlife. Puget Sound waters are conduits for a diverse array of chemical and biological contaminants that pose threats to human health, including disease causing pathogens, biotoxins producing harmful algal blooms, and toxic chemical contaminants (Puget Sound Partnership Strategic Science Plan 2010). Furthermore, some human population groups (e.g., Native Americans, Asian-Pacific Islanders) may be at an increased risk of exposure due to their location of residence and dietary needs and preferences (Puget Sound Partnership Strategic Science Plan 2010). Finally, loss of valued species such as salmon and orca negatively impact economic, social, and cultural sense of wellbeing.

Puget Sound Partnership

In recognition of declining ecosystem health, a Blue-Ribbon Task Force in 2006 provided an expanded vision for a healthy Puget Sound that formally linked human wellbeing to ecosystem health:

> Puget Sound forever will be a thriving natural system, with clean marine and freshwaters, healthy and abundant native species, natural shorelines and places for public enjoyment, and a vibrant economy that prospers in productive harmony with a healthy Sound. The Puget Sound ecosystem is healthy if we achieve the following goals and can measure results. (Puget Sound Task Force 2006)

Subsequently, in 2007 Governor Gregoire, through the Washington State Legislature, created a new agency, the Puget Sound Partnership (PSP), with the express purpose of facilitating the recovery of Puget Sound by the year 2020. PSP was tasked as the administrative entity to coordinate governments, tribes, scientists, and businesses to develop and comply with recovery targets and strategies. More than 100 cities, 12 counties, 12 conservation districts, 12 local health jurisdictions, 28 local port districts, 3 regional governmental bodies, 22 tribes, 14 state agencies, and 9 federal agencies are active in Puget Sound protection and restoration. The Partnership is governed by a Leadership Council, and guided by an Ecosystem Coordination Board (regional stakeholders) and a Science Panel. The Partnership's assignments combine the water quality, habitat, species protection and restoration initiatives of one predecessor organization—the Puget Sound Action Team, which was a program of the Washington State Governor's Office; the salmon recovery initiatives of another predecessor organization—Shared Strategy for Puget Sound, which was a non-governmental organization that developed an innovative, locally driven recovery plan for salmon populations at risk of extinction; along with the expanded vision of explicitly linked human wellbeing and ecosystem health.

The authorizing legislation for PSP clearly acknowledged the relationship between humans and ecosystem health. The term "quality of life" was used to describe the human dimensions of an ecosystem management framework having six major goals:

1. Healthy people supported by a healthy Puget Sound;
2. The quality of human life sustained by a healthy Puget Sound;
3. Puget Sound species and the web of life thrive;
4. Puget Sound habitat is protected and restored;
5. Puget Sound rivers and streams flowing at levels that support people, fish and wildlife, and the environment;
6. Puget Sound marine and fresh water are clean.

Although there are human dimensions imbedded within each of the six goals, PSP specifically called out human quality of life (or human wellbeing—the descriptive term used in this article) as a stand-alone ecosystem management goal, indicating the need to manage for functioning ecosystems that support not only natural systems but social and cultural wellbeing and economic vitality as well. The vision was expressed by four guiding principles (Sound Health Sound Vision 2006):

1. Aesthetic values, opportunities for recreation, and access for the enjoyment of Puget Sound are continued and preserved.
2. Upland and marine resources are adequate to sustain the treaty rights, as well as the cultural, spiritual, subsistence, ceremonial, medicinal needs, and economic endeavors of the tribal communities of Puget Sound.
3. The Puget Sound ecosystem supports thriving natural resource and marine industry uses such as agriculture, aquaculture, fisheries, forestry, and tourism.
4. The Puget Sound's economic prosperity is supported by and compatible with the protection and restoration of the ecosystem.

Managing for human wellbeing and economic prosperity is proving to be a challenging task, however, as there has been relatively little research and guidance on how to understand and incorporate social data. A 2008 synthesis of the various quality of life or human wellbeing activities conducted in the region described three social–economic–ecosystem interactions characteristic to Puget Sound (Cassin, Knauer, and Wellman 2008). Collectively, these themes contributed to a human dimensions framework that PSP used to begin a long-term ecosystem management strategy that explicitly suggests the need for input from the social sciences. Cassin, Knauer, and Wellman (2008) outline the three themes as:

1. *The natural capital of Puget Sound enhances human wellbeing.* The Puget Sound provides significant ecosystem services that benefit both a market economy as well as human wellbeing (Peterson and Lubchenko 1997). Puget Sound has provided natural capital to several industries since early settlement, including: commercial harvest of crab, fish (predominately salmon), and shellfish (predominately oysters, mussels, clams, and more recently, geoduck) production, forestry, marine transportation, and tourism. The Puget Sound region can, if well managed, also produce valued services including natural flood and storm protection; water purification from wetlands; places to go hiking, kayaking, wildlife watching; and ethical, spiritual and cultural sustenance from a myriad of species, habitats and special places.
2. *People are powerfully connected to Puget Sound landscapes and resources.* One of the specific ecosystem services provided by every landscape is the unique features and qualities that contribute to a regional and local sense of place (Stedman

2003). Sense of place is generally defined as the meaning attached to a particular setting by a person or group of people (Jorgensen and Stedman 2001). Senauer (2008) indicates that there is growing evidence that various experiences in nature could be vital to our health, development, and wellbeing, providing a brief summary of some of the key evidence to date. Puget Sound offers a spectacular array of aquatic and terrestrial landscapes that are treasured by residents and visitors alike. Yet there is an incomplete understanding regarding how changes to the natural and built environment affect peoples' personal connection to their "place" and the potential desire to take action to protect that to which they are connected. Although technically challenging, including sense of place considerations in the forefront of environment decisions is a necessary first step to ensuring that diverse sets of stakeholders are systematically accounted for within resource management decision-making processes overtime. At the same time, it is important to recognize that not all residents of Puget Sound place significant value on conserving, maintaining, or restoring functioning natural systems. There are those that place an equal or higher value on the built environment (e.g., shopping malls, transportation corridors, affordable housing developments) over the natural environment. Accordingly, enhancements to Puget Sound environmental policies, programs, management, and regulatory regimes will be necessary to manage for the inevitable sets of tradeoffs presented by regional population growth and an ever changing set of values held for the natural and built environments.

3. *Humans impact the environment both negatively and positively*. People have served as agents of positive change as well as threats to ecosystem health within Puget Sound (Puget Sound Partnership Strategic Science Plan 2010). Examples of positive actions include successful open space acquisition initiatives within the region that provided permanent protection for vast acreage of ecologically rich areas, working resource lands, riparian corridors, and other important networks of parks and regional trails. Puget Sound residents, interest groups, and communities have also provided leadership in recovering and expanding habitats of endangered species; in mandating green infrastructure/low impact development approaches to storm water management; promoting compact, walkable communities; and pursuing multimodal transportation strategies. At the same time, however, dispersed human settlement patterns in the Puget Sound region, land cover change from vegetation to impervious surfaces, transportation corridors, consumption of marine resources, and the management of surface water resources, while providing significant benefits to quality of life, also have contributed to deterioration of the health of Puget Sound ecosystems (Cassin, Knauer, and Wellman 2010).

The diversity of human perspective, values, and opinions governing human actions make it exceedingly difficult to capture the range of tradeoffs associated with human actions and their effects on quality of life and ecosystem health (Ruckelshaus and McClure 2007). A human action intended to achieve one set of individual or societal outcomes typically affects human wellbeing in a variety of (sometimes inequitable) ways across the populace (Schneidler and Plummer 2009). Managing for quality of life and ecosystem health requires a systematic approach to examine the range of direct and indirect tradeoffs associated with human actions. PSP has adopted the perspective that humans will always serve as change agents to their environment and the more completely they understand the diverse values guiding human–ecosystem interactions, the more likely they will successfully mitigate the

negative impacts from the additional one million people forecast to arrive by 2025 (Alberti et al. 2007).

These three themes highlights that individuals and communities across multiple scales (i.e., property, neighborhood, community, and region) are needed to participate in the bottom up/top down ecosystem management strategy required to manage for the human dimensions of ecosystem health in Puget Sound. In 2011, recognizing the need to enhance the role of the social sciences in ecosystem recovery and indicator development in particular, a Social Science Subcommittee was established as part of the PSP Science Panel to focus on research gaps and knowledge building. One of the committee's first tasks was to implement a workshop (Wellman et al. 2011) where social science academics and professionals could offer guidance in addressing the gaps in understanding about the human dimensions of ecosystem recovery. A significant outcome of this workshop was the identification of several social science research needs, including a study on residential behavior related to the marine environment, research on Puget Sound social capital, an institutional analysis of the region, and an analysis of the communication network within the regional scientific community. Each of these has since been completed and the results of several are contributions to this special issue.

The State of Social Science in the Puget Sound

The articles in this special issue represent some of the recent social science research in the region. Each article discusses the theoretical foundations and contributions, research methods and results, and how results are or can be incorporated to enhance Puget Sound restoration efforts. Several of the studies were solicited by the Puget Sound Partnership and its collaborating scientific body, the Puget Sound Institute at University of Washington Tacoma, while others were pursued independently. These studies, marking a convergence of support by the PSP and the regional scientific community, offer theory and findings that can address management questions and generate future socioecological research programs.

The first article, "A Complex Tool for a Complex Problem: Political Ecology in the Service of Ecosystem Recovery" (Breslow) presents the results of an ethnographic study looking at diverse stakeholder perceptions about the causes of salmon decline and the implications for recovery strategies. This article exemplifies how in-depth, qualitative research can greatly inform the discussion about environmental issues, allowing consideration of multiple stakeholder values and perspectives and how those may differ from the prevailing focus of current political efforts. Understanding these differences can enable agencies like PSP to develop better language and consider more widely supported restoration efforts. It can also help identify appropriate definitions of restoration that can be applied across diverse cultural interests.

The second article, "Collaboration within the Puget Sound Marine and Nearshore Science Network" (Hoelting et al.), demonstrates methods for understanding stakeholders in restoration. In this case, the authors use social network analysis to explore the relationships between regional social and natural scientists, identifying where communication and influence primarily reside. The authors note that social scientists are fewer and primarily isolated from natural scientists and highlight the incentives and barriers to collaboration. This type of network analysis is important to understand the flow of scientific information, how it can influence decisions made by agencies such as PSP, and the types of structures that should be in place to facilitate such interaction.

The next three articles describe how to develop appropriate measures of the human dimensions for the purposes of monitoring the response of human wellbeing to potential

climate change impacts (Donatuto et al.) or general ecosystem recovery strategies (Biedenweg et al.) and evaluating the individual behaviors of Puget Sound residents that have the greatest individual impact on Puget Sound ecosystems (Ward et al.). In "Indigenous Community Health and Climate Change: Integrating Biophysical and Social Science Indicators," Donatuto et al. share a process for examining social and natural science indicators relevant to climate change in the United States and Canadian Salish Sea. The authors conclude that current climate change assessments do not reflect key community health concerns, particularly those relevant to indigenous communities, even though these concerns are vital to successful climate change adaptation plans. The authors provide data and evidence to support the claim that understanding how indigenous measures of health relate to ecosystem health are critical aspects to viable recovery planning.

Defining human health and wellbeing indicators has clearly been a critical step in the Puget Sound's integration of social and ecological science for recovery. Biedenweg et al., in "Developing Human Wellbeing Indicators in the Puget Sound: Focusing on the Watershed Scale," describe a multi-step process for developing human wellbeing indicators related to the status of natural resources. This process includes the compilation of existing social indicators and the ranking and refining of these indicators by regional stakeholders and social scientists. As a pilot study to inform the PSP quality of life index, this process will be replicated in several watersheds to find common indicators at the Puget Sound scale. These indicators will then guide the development and evaluation of PSP restoration strategies so that both human wellbeing and ecological health are taken into consideration.

In "The Sound Behavior Index: A Management Tool for Behavioral Aspects of Ecosystem Restoration," Ward et al. describe the development of a phone survey designed to track changes in environmentally responsible behaviors over time. This survey has been implemented once and will be replicated over time to understand the change in individual pressures to Puget Sound ecosystems. It will also be used to inform PSP's social marketing efforts, highlighting topics most in need of emphasis. Most importantly, the index has been adopted as one of PSP's vital signs that are measured and reported on every two years.

The Future of Social Science for Ecosystem Recovery

The escalating pace of environmental change in the Puget Sound basin and other large ecosystems suggests that new scientific approaches are needed to both assess effects and evaluate potential solutions. Scholars of diverse disciplines, from economics and sociology to ecology and earth sciences, call out the importance of explicitly linking human and ecological processes when studying the wellbeing of both natural and social systems, particularly in urbanized areas such as the Puget Sound basin (Grimm et al. 2000; Pickett et al. 2001; Alberti et al. 2003; Gragson and Grove 2006; Crane and Kinzig 2005; Alberti 2008). Some resource professionals also seek to simultaneously address both human and natural systems to achieve practical goals. Studies and models of successful coupled human–natural systems are needed, as complex, co-dependent patterns and processes may not be understood when studied separately by social or natural scientists (Brunkchhorst 2002; Liu et al. 2007).

As the articles in this special issue attest, there is significant momentum in the Puget Sound to develop social measures to better understand the interactions between human processes and ecosystem dynamics. Although few of these examples specifically measure coupled social–ecological systems, each represents the diversity of social science research methods and theoretical foundations that can be incorporated into such efforts. As humans live and work within the natural world, understanding their diverse relationships to natural

resources is a critical step to accurately assessing the status of a social–ecological system and potential strategies to improve both natural resources and human wellbeing. A strong social-science-oriented research and monitoring foundation is critical in this effort. We hope that the studies presented here provide some examples for how such research can be done, and how it might influence ecosystem recovery.

Acknowledgments

We thank the editors of *Coastal Management* for their thoughtful contributions to the content of this special issue. We also thank the anonymous reviewers who greatly improved the quality of each contributed article.

Funding

Partial funding for the preparation of this article came from NSF grant #1215886.

References

Alberti, M. 2008. *Advances in urban ecology: integrating human and ecological processes in urban ecosystems*. New York: Springer.

Alberti, M., J. Marzluff, E. Shulenberger, G. Bradley, C. Ryan, and C. Zumbrunnen. 2003. Integrating humans into ecology: Opportunities and challenges for urban ecology. *Bioscience* 53 (12): 1169–1179.

Alberti, M., P. Christie, J. Marzluff, and J. Tewksbury. 2007. Interactions Between Natural and Human Systems in Puget Sound. Sound Science: Synthesizing Ecological and Socioeconomic Information about Puget Sound Ecosystem. http://www.psp.wa.gov/downloads/ACTION_AGENDA_2008/TopicPapers/12_16_08HWBPaper.pdf (accessed October 2, 2013).

Brunckhorst, D. 2002. Institutions to sustain ecological and social systems. *Ecological Management and Restoration* 3 (2): 108–116.

Cassin, J., J. Knauer, and K. Wellman. 2008. Steps Toward a Human Wellbeing Framework: Informing the Puget Sound Partnership and Action Agenda. Prepared for the Puget Sound Partnership. Seattle, Washington.

Cheng, A. S., L. E. Kruger, and S. E. Daniels. 2003. "Place" as an integrating concept in natural resource policies: Propositions for a social science research agenda. *Society and Natural Resources* 16:87–104.

Crane, P., and A. Kinzig. 2005. Nature in the metropolis. *Science* 308:5726–1225.

Endter-Wada, J., D. Blahna, R. Krannich, and M. Brunson. 1998. A framework for understanding social science contributions to ecosystem management. *Ecological Applications* 8 (3): 891–904.

Fox, H. E., C. Christian, J. C. Norby, O. R. Pergams, G. D. Peterson, and C. R. Pyke. 2006. Perceived barriers to integrating social science and conservation. *Conservation Biology* 20 (6): 1817–1820.

Gragson, T. L., and M. Grove. 2006. Social science in the context of the long term ecological research program. *Society and Natural Resources* 19 (2): 93–100.

Grimm, N., J. M. Grove, S. T. Pickett, and C. L. Redman. 2000. Integrated approaches to long-term studies of urban ecological systems. *Bioscience* 50:571–584.

Jorgensen, B. S., and R. C. Stedman. 2001. Sense of place as an attitude: Lakeshore owners' attitudes toward their properties. *Journal of Environmental Psychology* 21:233–248.

Lowe, R., G. Whitman, and J. Phillipson. 2009. Ecology and the social sciences. *Journal of Applied Ecology* 46:297–305.

Liu, J., T. Dietz, S. Carpenter, C. Folke, M. Alberti, C. Redman, S. Schneider, et al. 2007. Complexity of coupled human and natural systems. *Science* 317 (5844): 1513–1516

Mascia, M. 2003. Conservation and the social sciences. *Conservation Biology* 17 (3): 649–650.

Nyhus, P. J., F. R. Westley, R. C. Lacy, and P. S. Miller. 2002. A role for natural resource social science in biodiversity risk assessment. *Society and Natural Resources* 15: 923–932.

Peterson, C. H., and J. Lubchenko. 1997. Marine ecosystem services. In *Nature's services: Societal dependence on natural ecosystems*, ed. G. C. Daily, 177–194. Washington, DC: Island Press.

Pickett, S. T., M. L. Cadenasso, J. M. Grove, C. H. Nilon, R. V. Pouyat, W. C. Zipperer, and R. Costanza. 2001. Urban ecological systems: Linking terrestrial ecological, physical, and socioeconomic components of metropolitan areas. *Annual Review of Ecological Systems* 2001:127–157.

Puget Sound Partnership. 2010. Strategic Science Plan. Prepared for the Puget Sound Partnership by the Puget Sound Partnership Science Panel. Olympia, Washington.

Redman, C. L., J. M. Grove, and L. H. Kuby. 2004. Integrating social science into long-term ecological research network: Social dimensions of ecological change and ecological dimensions of social change. *Ecosystems* 7:161–171.

Ruckelshaus, M. H., and M. M. McClure. 2007. Sound Science: Synthesizing ecological and socioeconomic information about the Puget Sound ecosystem. Prepared in Cooperation with the Sound Science Collaborative Team. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center. Seattle Washington. http://www.nwfsc.noaa.gov/research/shared_science/documents/SoundScience07.pdf (accessed November 10, 2013).

Schneidler, M., and M. Plummer.2009. Human Well Being Indicators in Puget Sound. NOAA Human Dimensions Group. Report Prepared for the Puget Sound Partnership.

Shipman, H. 2008.A Geomorphic Classification of Puget Sound Nearshore Landforms. Puget Sound Nearshore Report No. 2008-01.Published by Seattle District, U.S. Army Corps of Engineers,Seattle,Washington. http://pugetsoundnearshore.org/technical_papers/concept model _06.pdf (accessed December 8, 2013).

Sound Health Sound Vision.2006.Puget Sound Partnership Recommendations.

Stedman, R. C. 2003. Is it really just a social construction? The contribution of the physical environment to sense of place. *Society and Natural Resources* 16:671–685.

Stinchfield, H.M., L. Koontz and N.R. Sexton. 2008. Social and economic considerations for coastal and watershed restoration in Puget Sound, Washington - A literature review. U.S. Geological Survey Open-File Report 2009-1079.

Susskind, L. R., K. Jain, and A. O. Martyniuk. 2001. *Better environmental policy studies: How to design and conduct more effective analyses*. Washington, DC: Island Press.

Thomson, R. E. 1994. Physical oceanography of the Strait of Georgia–Puget Sound–Juan de Fuca Strait System. Canadian Technical Report Fisheries and Aquatic Science 1948:36–98.

UERL (Urban Ecology Research Lab). 2008. Puget Sound Future Scenarios. Prepared by the University of Washington Urban Ecology Research Lab for Puget Sound Nearshore Partnership, May 2008. http://www.pugetsoundnearshore.org/program_documents/ps_future-scenarios_may08.pdf (accessed November 15, 2013).

Wellman, K., E. Skewgar, D. Ward, S. Brace, H. Culverwell, and J. Knauer. 2011. Human Dimensions of Puget Sound and Washington Coast Ecosystem-Based Management. A Workshop Report Prepared for the Puget Sound Institute and Washington Sea Grant. Seattle, Washington.